Math 1300

Sample Final Exam

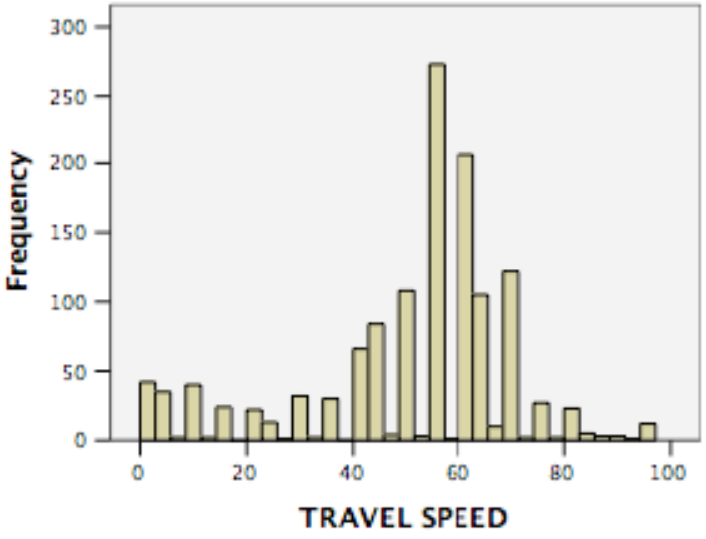
(10 pts) 1. The table below shows approximate sales of Vanilla Ice albums. Compute the mean and median of the sales data. Why is there such a large difference in the two values?

Year	Title	Sales (000's)
1989	Hooked	48
1990	To The Extreme	17000
1991	Extremely Live	500
1991	Cool As Ice	500
1994	Mind Blowin'	45
1998	Hard to Swallow	500
2001	Bi-Polar	20
2005	Platinum Underground	15

(10 pts) 2. The graph is a histogram of travel speeds of cars involved in fatal accidents in missouri.

a. Describe the shape of the distribution and note any interesting features.

b. Explain why there are gaps between the bars, giving a 'comb' effect.



(10 pts) 3. Human earlobes are generally of two types, attached or free. In a Japanese population, 67% of subjects have free earlobes.

a. What is the probability that a randomly selected Japanese subject has attached earlobes?

b. What is the probability that in a simple random sample of five Japanese subjects, none have attached earlobes?

c. What is the probability that in a simple random sample of five Japanese subjects, less than two have attached earlobes?

(10 pts) 4. In each part, decide if the study described is an **experiment** or **observational study**, then explain **what type of significance test** you would use to analyze the results.

a. A car manufacturer examines a random sample of warranty claims filed over the past two years, and records the day of week that the car was built. They want to test whether defects are uniformly distributed over the day of week the car was built.

b. A study investigates whether prescription drugs are cheaper in Canada. For each of the 20 most popular prescription drugs, the price in the US and the price in Canada are recorded.

c. A study wants to determine if seeding clouds with silver iodide increases rainfall. In the study, 52 clouds were randomly assigned to be seeded or not, and the amount of rain each cloud generated was measured.

(10 pts) 5. A supermarket takes a random sample of 40 cartons of eggs and gives a 95% confidence interval for the mean number of broken eggs per carton as [0.81,0.89].

True or False:

a. Between 81% and 89% of cartons contain a broken egg.

b. 95% of the cartons contain between 0.81 and 0.89 broken eggs.

c. The mean number of broken eggs per carton is contained in the interval [0.81,0.89] at least 95% of the time.

d. The mean number of broken eggs per carton is less than 1, for certain.

e. If you want to make an omelet, you have to break some eggs.

(10 pts) 6. Fox News conducts regular polls using a random sample of 900 registered American voters. What is their margin of error at 95% confidence? (Use the worst case scenario.)

(10 pts) 7. Suppose a two-tailed hypothesis test results in a test statistic of $z = -2.15$. Find the P-value for this test, and draw a sketch of the normal distribution with the corresponding area shaded.

(10 pts) 8. In 1798, Henry Cavendish measured the density of the Earth using a torsion balance. He took 29 measurements, shown in the table at right. Each measurement is the density of the earth as a multiple of the density of water.

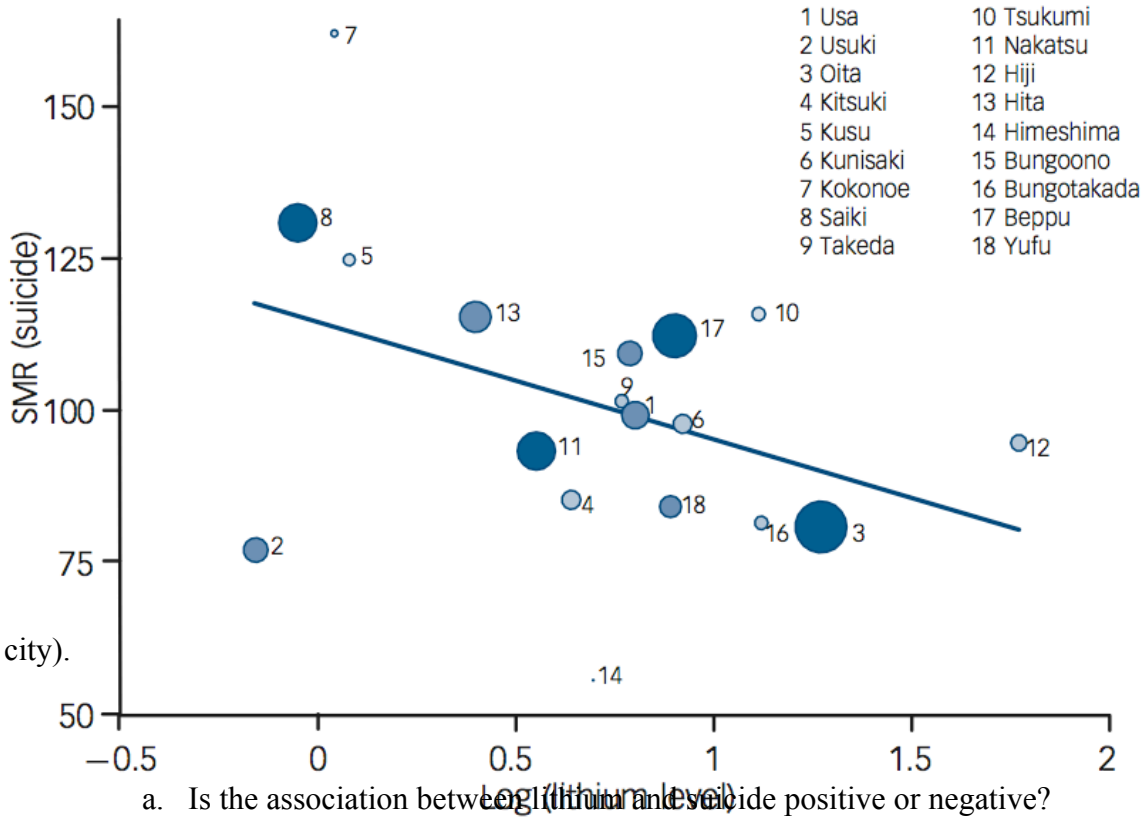
Make a stemplot or histogram to show the distribution of these values.

Density
5.50
5.57
5.42
5.61
5.53
5.47
4.88
5.62
5.63
4.07
5.29
5.34
5.26
5.44
5.46
5.55
5.34
5.30
5.36
5.79
5.75
5.29
5.10
5.86
5.58
5.27
5.85
5.65
5.39

(10 pts) 9. Cavendish's 29 measurements have a mean $\bar{x}$ = 5.42 and a standard deviation s = 0.34.

State and carry out a hypothesis test that his results are significantly different from the modern accepted density of 5.5 g/cm^3.

(10 pts) 10. In March 2009, Japanese researchers published a study of lithium in drinking water and suicide rates. They measured both variables on 18 cities in one area of Japan. The scatterplot and regression of suicide rate on log(lithium level) is shown below (dot size is related to the size of the city).



a. Is the association between lithium and suicide positive or negative? Explain what this means.

b. The researchers tested the hypothesis that suicide and drinking water lithium levels are related. For men, they gave a P-value of 0.0004, and for

women they reported $0.05 < P < 0.06$. Is the relationship significant at the 5% level for men? For women?

Data for problems 11, 12, and 13 is in the file balance`.rda`. The variables are:

SUBJECT: An identifier for each subject.
AGE: 1 for Elderly, 2 for Young.
FORWARD_BACKWARD : Sway range (mm) in front-back plane.
SIDE_SIDE: Sway range (mm) in side-to-side plane

(10 pts) 11. State and carry out a hypothesis test that FORWARD_BACKWARD balance is different between the young and elderly

(10 pts) 12. State and carry out a hypothesis test on all subjects that, regardless of age, FORWARD_BACKWARD balance is different from SIDE_SIDE balance.

(10 pts) 13. Find the 95% confidence interval for SIDE_SIDE balance among the Elderly.

Data for problems 14 and 15 is in the file `swine_flu.sav`. The variables are:
DAY: # of days since Day 0, April 24, 2009, when the first US cases were confirmed.
CASES: The number of official US cases of swine flu
(Source: World Health Organization)

(10 pts) 14a. Find the equation of the least squares regression line for number of CASES as a function of DAY.

b. Use the regression line to extrapolate the number of cases there will be one week from today (which will be DAY 19).

c. How well does the regression line on DAY explain number of CASES? Discuss the fit of the line to the data.

(10 pts) 15. Diseases typically spread at an exponential rate (at first). Compute a new variable, LOG_CASES which is the log of the number of CASES.

a. Give the equation of the regression line of LOG_CASES as a function of DAY.

b. Use the regression line to extrapolate the value of LOG_CASES one week from today (DAY 19).

c. How many cases does this model predict for one week from today?